WINDSPOT®

ON-GRID / OFF GRID

1.5 KW / 3.5 KW

USER MANUAL

Installation

Operation

Maintenance

Resvision	Comments	Date	Edition
0	First edition	----------	--------
A	Data sheet update Mounting instructions Rev. table	17/05/2011	1
B	Unified manual WS 1.5/3.5 Technical data WS 1.5	27/07/2011	1

WINDSPOT®

Welcome

Thanks for choosing WINDSPOT.

If you have any comments or questions, please don't hesitate to contact our customer service department: info@windspot.es

ATTENTION!: Before going any further, please read carefully the instructions on point 9."Commissioning" in order to be eligible for Sonkyo Energy's warranty. Sonkyo Energy obeys the law in force on protection of personal data.

WINDSPOT

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1 -About Sonkyo Energy

SONKYO ENERGY wishes to co-operate in the transition towards a sustainable energy model based on a greater leverage of renewable energy and distributed generation systems. With this ambitious objective in mind, SONKYO ENERGY runs an important R&D department that employs professionals with over 25 years of experience in the field of renewable energy, especially in wind power. This team is committed to the development of products whose key features are based on design, reliability and efficiency.

SONKYO ENERGY's activities mainly concentrate on small wind power systems with a range that currently comprises 1.5, 3.5, 7.5 and 15 KW models. In order to develop this activity we have 7000 m2 of installations in Santander, a city in the north of Spain, where we perform design and production activities. In the next stage, all our products go first through a test phase at our own installations and then are subjected to tests at independent technology centers.

2 -WINDSPOT Technical specifications

POWER	1.5 KW @ 250 rpm	3.5 KW @ 250 rpm
ROTOR DIAMETER	4.05 m	4.05 m
CUT IN SPEED	3 m/s	3 m/s
RATED SPEED	9 m/s	12 m/s
WEIGHT	165 kg	185 kg
TOTAL LENGTH	3.17 m	3.2 m
STIMATED ANNUAL PRODUCTION	4696-7518 kWh (5-7 m/s ; 11.2-15.7 mph)	5550-11300 kWh (5-7 m/s ; 11.2-15.7 mph)
CO2 SAVED	3052-4887 kg (5-7 m/s) 6728 -10773 lb (11.2-15.7 mph)	3610-7350 kg (5-7 m/s) 8000-16200 lb (11.2-15.7 mph)
TYPE	Up-Wind horizontal rotor	
GENERATOR	Synchronous, permanent magnets; 3 phases, 24-48-120-220 V , 50/60Hz	
YAW CONTROL	Passive system: Yaw tail	
POWER CONTROL	Passive variable pitch system, centrifugal and absorbed (design patented)	
TRANSMISSION	Direct	
BRAKE	Electric	
CONTROLLER	On-grid or off-grid connection option	
BLADES	Polyester resin reinforced with Fiber glass	
INVERTER	Efficiency ≈ 95% ; Algorithm MPPT	
NOISE	37 dB (A) from 60 m. (65 yd) with a wind speed of 8m/s (18 mph).	
ANTI-CORROSION PROTECTION	Sealed design + galvanizing + e-coat + anodizing + UV resistant paint	
TOWER	12, 14 and 18 m. (39 ,46 and 59 ft); hydraulic or mechanical lay down system	
DESIGN	According to IEC61400-2	
SURVIVAL WIND SPEED	60 m/s (class 1 according to IEC61400-2)	
TEMPERATURE RANGE	-20 C / 50 C (extrem conditions according to IEC 61400-2)	

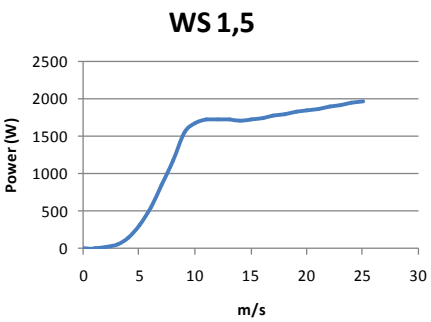
2.1 -Power curve and annual production

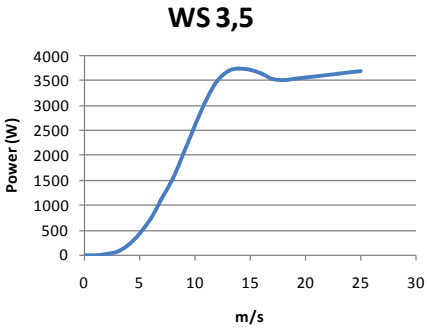
Power curve

The Windspot 1.5 rated power is obtained with a wind speed of 9 m/s and the Windspot 3.5 with 12 m/s.

The maximum voltage that the on grid wind turbine can reach is 500V. (For the off-grid system it will always be less).

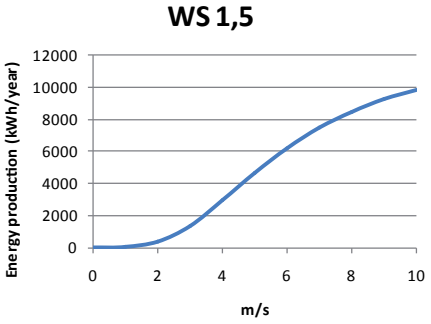
From that voltage the variable pitch system starts to work and avoids over voltage and over power which could damage the system.

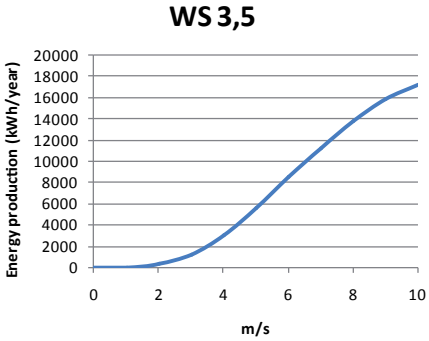




Annual energy production

The diagram below shows an estimate of the energy produced in one year with different average wind speed. To calculate the production it has been taken into account the Weibull distributed probability.





2.2 -Noise:

The noise of the WINDSPOT has been measured at SONKYO ENERGY facilities reporting the following results:

From a distance of 60 meters and with a constant wind of 8 m/s it was registered a noise level of 45dB (A) (according to BWEA standard).

The following table shows a reference of the different noise intensity made by common situations.

dB Table	
Silence	0
Footstep	10
Tree leaves	20
Quite conversation	30
Library	40
Quiet office	50
Conversation	60
Traffic	80
Vacuum cleaner	90
Motorbike	100
Rock concert	120
Pneumatic hammer	130
Airplane taking off	150
Explosion	180

2.3 -Why Windspot is your best option?

Variable pitch:

The greatest innovation to our wind turbines is the incorporation of a new patented variable pitch system which prevents, in the event of heavy winds, any surges that may damage both the generator and the electronics. By means of a simple robust and reliable dampener mechanism, this passive system uses the centrifugal force created by the spinning of the wind turbine to change the angle of attack of the blades. The straightforward design and the use of high-quality materials, such as stainless steel, anodized aluminum and bronze, allow a smooth working order even in gusty situations.

Blades:

The blades are manufactured using RTM Light (Resin Transfer Molding) technology based on the use of polyester resin with fiber glass. This results in lightweight components of great mechanical resistance. They weigh less than a half of standard blades and provide enhanced mechanical resistance. This is the case because the blades are manufactured based on the most advanced technology used in large turbines. The blades of 1.5, 3.5, 7.5 and 15 KW wind turbines are capable of withstanding the strongest winds in any weather conditions. This provides excellent tensile strength and fatigue resistance. The surface finish provides an optimum balance between the lift/drag ratio, reducing horizontal forces to the minimum.

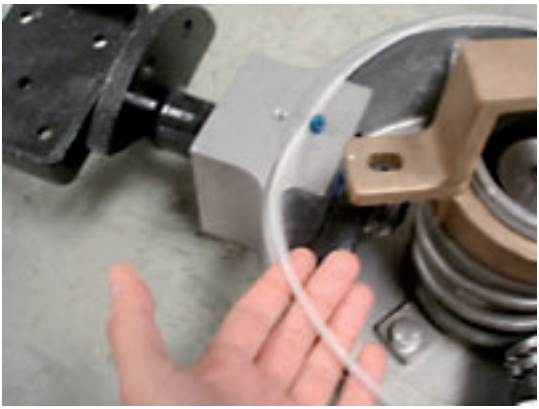
The Generator:

Permanent magnet rotor with high number of poles to reduce the rated speed to 200 rpm. This reduced rotation speed considerably reduces mechanical stress and noise, which are aspects to be considered under current legislation. A low cut-in speed enables it to work with wind speeds of 3m/sec.

Corrosion resistance:

Windspot has been designed to last for over 20 years. For that reason, a lot of procedures have been taken to avoid the corrosion of the pieces.

The aluminum pieces have been anodized, an e-coating treatment has been applied to steel pieces as well as anti-corrosion protection paint. All the hardware is stainless steel too. Moreover, all the pieces that can be damaged by the action of humidity are sealed.



This is the joint between the cone and the framework of the variable pitch.

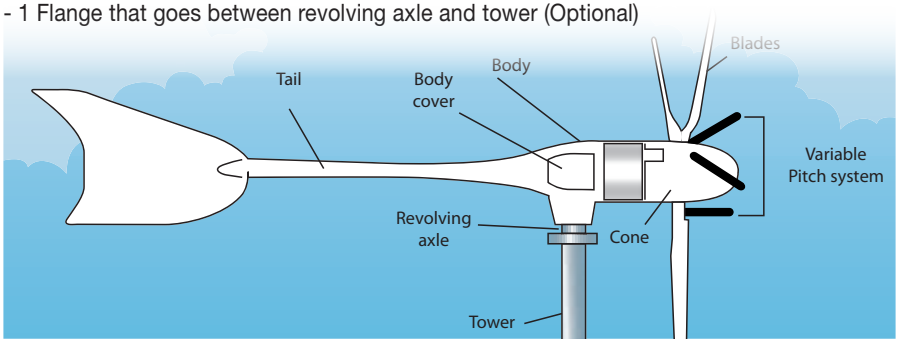
This is the seal that goes bewteen the body and the body covers.

3 -Now you have a WINDSPOT

3.1 -Packaging:

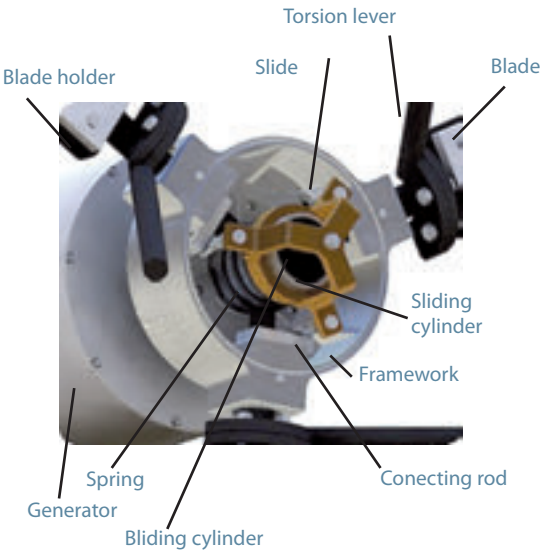
WINDSPOT will be supplied in a 2260 x 930 x 750 mm box that includes:

- Main body + generator + variable pitch
- Hardware (please see all details below)
- 1 Tail
- 3 Blades
- 1 Controller (off grid or on grid)
- 1 Inverter (Optional)
- 1 Flange that goes between revolving axle and tower (Optional)



Pieces breakdown:

- 3 blades
- 3 protector plates for blades
- 1 variable pitch
- 1 coupling: variable pitch – generator
- 1 generator
- 1 main body
- 2 body covers
- 1 tail
- 1 coupling: Revolving axle – tower
- 1 set of brushes
- 1 set of brass rings
- 1 Flange that goes between revolving axle and tower (Optional)

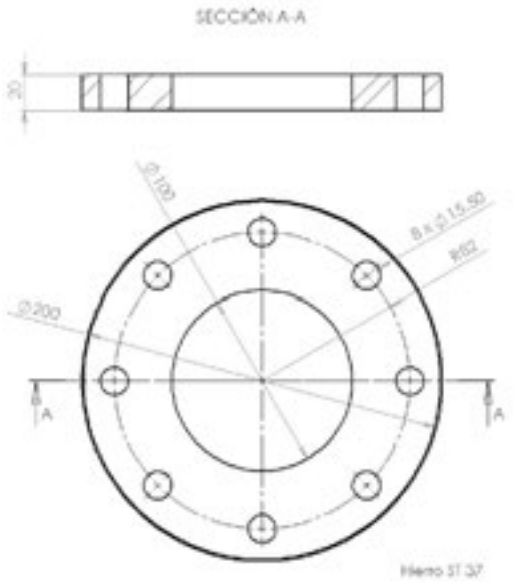


Hardware:

Bolts (metric x length)	Pieces that joint	Quantity
M10 x 90	Blades – Blade holders	15
M12 x 50	Blade holder – Torsion lever	6
M10 x 50	Main body – tail	8
M14 x 60	Revolving axle – tower	8
Nuts (metric)	---	---
M10	Blades – Blade holder	15
M12	Blade holder – Torsion lever	6
M14	Revolving axle – tower	8
Washer (metric)	---	---
M10	Blades – Blade holder	30
M12 x 50	Blade holder – Torsion lever	12
M10	Main body – tail	8
M14	Revolving axle – tower	16

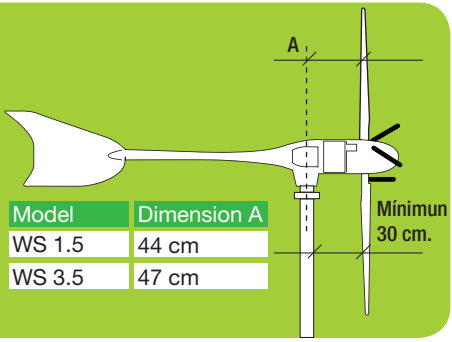
3.2 -Connection of the revolving axle to the tower:

For customers who have their own tower we have included a drawing of the flange that connects the revolving axle and the tower. That connection should be welded to the top part of the tower and screwed to the wind generator's revolving axle.



Remarks to take into account during the installation:

No matter what kind of tower is installed, the minimum distance between the blade and the tower must be at least 30cm.



Model	Dimension A
WS 1.5	44 cm
WS 3.5	47 cm

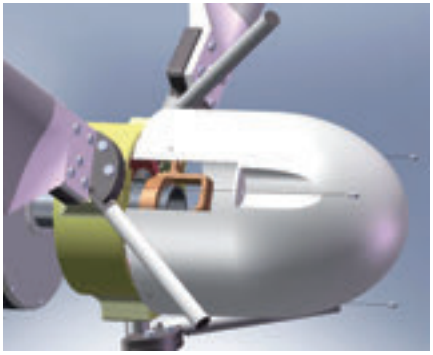
Data for the towers design:

* The data supplied have been obtained using IEC 61400-2 standard and does not include security factor.

WINDSPOT	WEIGHT	THRUST	OVERTURNING MOMENT
1.5	165 kg	4500 N / 650 N (fatigue)	1700 Nm / 500 Nm (fatigue)
3.5	185 kg	4500 N / 650 N (fatigue)	1700 Nm / 500 Nm (fatigue)

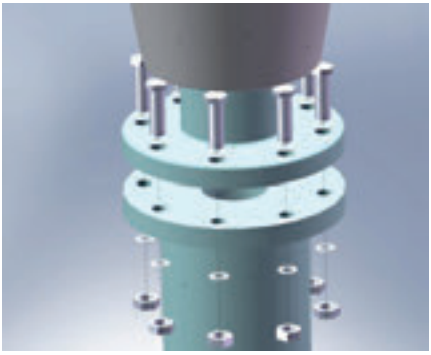
3.3 -Assembly:

Step 1 Cone:

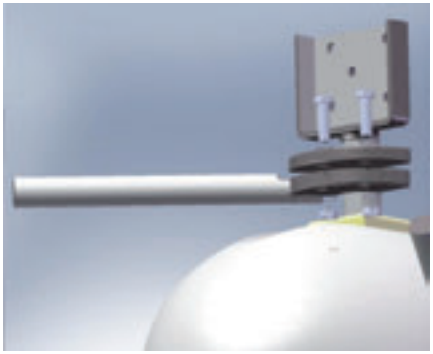


The cone comes mounted in the packaging

Step 2 Tower:

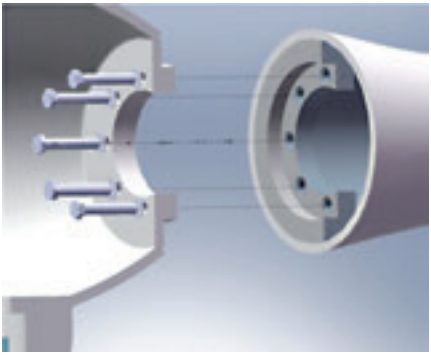


Step 3 Torsion lever:

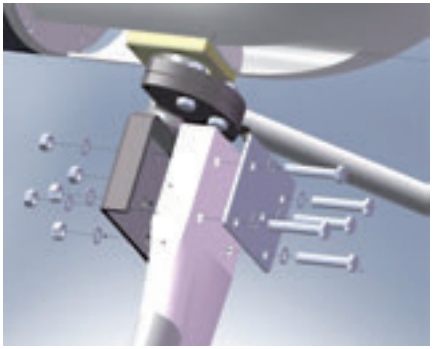


Place the torsion levers before the blades

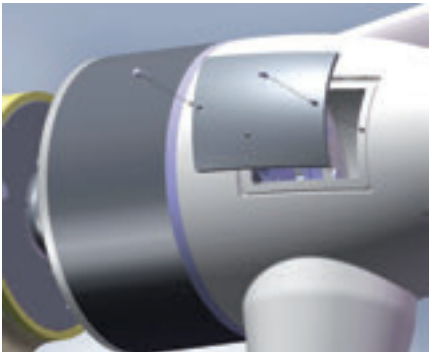
Step 4 Tail:



Step 5 Blades:



Step 6 Body covers:



3.4 -Installation

3.4.1 -Installation on a lattice tower

1st STEP:
Assemble the wind turbine: blades, tail and cone.

2nd STEP:
Hold the wind turbine with the crane's belt or strap by the strongest parts of the wind turbine. Please take a look at the picture below to identify the strongest parts.

3rd STEP:
Start elevating the wind turbine once it has been completely assembled.

4th STEP:
Channel the cables from the tower base to the top.
Wait for the reception and connection of the wind turbine to the tower.

5ºth STEP:
Fit the wind turbine, connect the cables and screw the wind turbine to the tower [1].

1- In order to avoid an overweight for the brushes connection, when connecting the wires which go from the wind turbine downwards till the tower base, these wires have to be fixed to the inner part of the tower. For fixing the wires to the tower, it is enough to weld a hook to the inner part of the tower's upper section and to revolve the wires around the hook three times.

3.4.2 -Installation in a tubular tower:

1st STEP:
The connection of the wind turbine to the tower should be done without fixing the blades[1].

2nd STEP:
Once the wind turbine is totally connected to the tower, you should proceed to assemble the tail.

3rd STEP:
After assembling the tail you should attach the blades.

4th STEP:
Once the wind turbine is totally assembled and fixed in horizontal position, connect the hydraulic piston to elevate the whole tower.

INSTALLATION

- **Prior to installation or maintenance operations, make sure the wind turbine is braked (with the 3 phases short-circuited) and remains disconnected from the grid.**
- **During installation or maintenance, the wind speed must be less than 6m/s**
- **Do not stay under the tower during installation or maintenance operations.**
- **Blades and holders must fit tight. for an easy assembly of the screws, we suggest to re-thread the holes with a drill bit 10.**
- **Check out the recommended pretension torques on Point 5: Maintenance.**

WARNING:

SONKYO ENERGY will accept no responsibility as a result of the misuse of the wind turbine. WINDSPOT must be installed by qualified workers and under no circumstances can be operated by other person without the installer or manufacturer's prior consent.

Wind turbine misuse can cause electrocution and skin burns and will imply the warranty's cancellation.

If your controller is for a battery-charge installation, you must read the USER MANUAL of MWP W4B 120C before its installation and check is configured for the voltage of your battery bank. Otherwise the controller may be damaged.

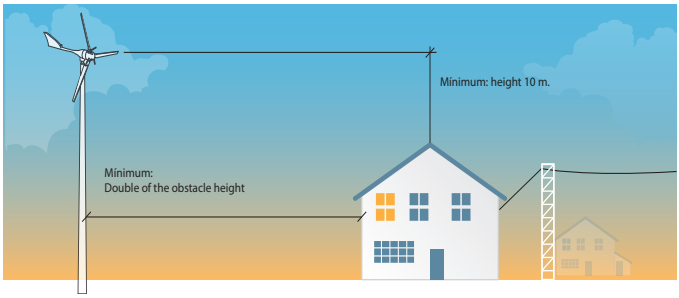
1- In order to avoid an overweight for the brushes connection, when connecting the wires which go from the wind turbine downwards till the tower base, these wires have to be fixed to the inner part of the tower. For fixing the wires to the tower, it is enough to weld a hook to the inner part of the tower's upper section and to revolve the wires around the hook three times.

3.5 -Where to place your WINDSPOT

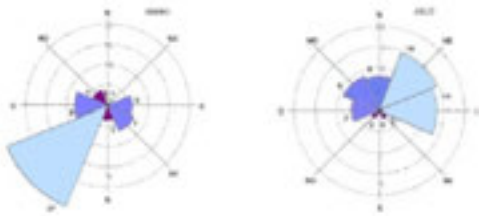
The right place to install the WINDSPOT wind turbine is as important as the wind speed available. You should take into account the following considerations

Land: Usually the highest point has better wind, however, areas around a river, valleys, high hills or mountains and wooden areas can affect the wind resource.

Obstruction: Obstruction is considered every obstacle that interferes in the direction of the wind, affecting the direction and the speed. The most common are houses and trees. It is recommended to install a tower 10 meter higher than any obstacle and at a distance twice the obstacle height. For example, if you have a 5 meter house and a 7 meter tree nearby the installation, you should install the WINDSPOT at 17meters height (7 meters height tree + 10 meters) and 10 meters away from the house (5 meters x 2) and 14 meters away from the tree (7 meter x 2).

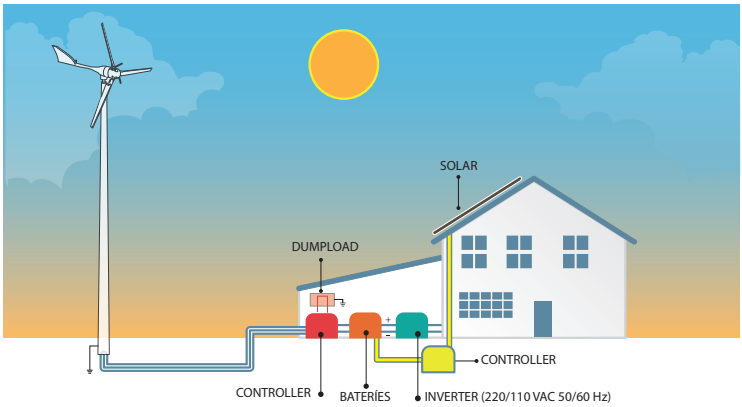


Predominant wind: It's very important to know where the direction of the predominant wind comes from in the area where you want to install the WINDSPOT. These data are usually available in studies made with an anemometer that measures the speed and the direction of the wind in a period of time. The result of these studies is drawn as a wind rose. Below you can find an example of two wind roses of the same place, one in summer and the other one in winter. As you can see, they are completely different, that's why a detailed study of the electricity demand in summer and winter will be of great help.

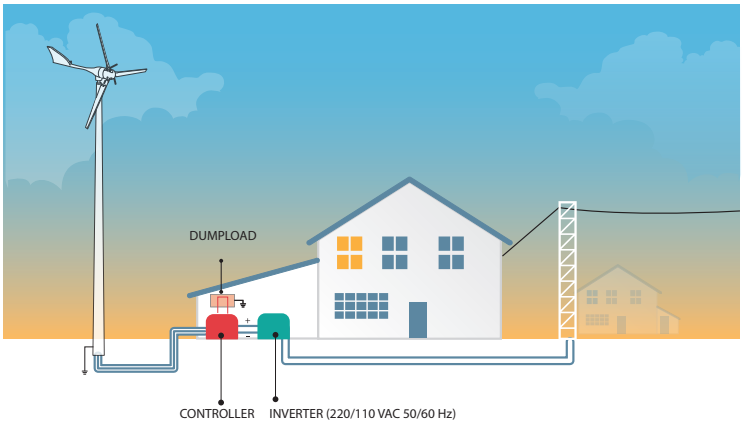


4 -Connection diagram

4.1 -Isolated installations:



4.2 -Grid connection:



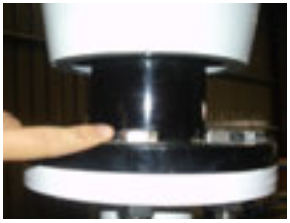
5 -Maintenance

WINDSPOT has been designed to work in a very efficient way with a minimum maintenance.
It is advisable to carry out a preventive service once every 18 months. In every checking you should pay attention to the following:

- Tight the wind turbine screws and nuts, including the variable pitch.

Blades

Tower – Wind turbine



Slide

Body covers

Slide

Slide – Framework

Body – Tail

Body – Generator

Axle coupling - Framework

Further you can find a list with the recommended torque values.

INSTALLATION:

- Prior to installation or maintenance operations, make sure the wind turbine is braked (with the 3 phases short-circuited) and remains disconnected from the grid.
- During installation or maintenance, the wind speed must be less than 6m/s
- Do not stay under the tower during installation or maintenance operations.

Thread	Recommended (Nm)
M6	7
M8	17
M10	33
M12	57
M14	91
M16	140

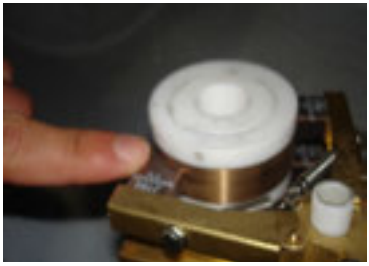
- Bearing grease.

Check the grease level of the bearings. If it is not enough, it should be greased with the greaser.

- Check that the variable pitch system works correctly by pressing the three torsion levers at the same time. You should feel the resistance of the spring and make sure it recovers the original position.

- Check the brushes

Check the copper rings



Check the connection of the cables

Installer	Date	Seal	Comments

6 -Theory

Depending on the speed at which it moves, the air has a different quantity of kinetic energy. In the following table you can see the names and characteristics of each wind type, according to BEAUFORT scale (used on land).

Grade	Description	Effects in land	Speed (Km/h)
0	Calm	Still, calm air, smoke will rise vertically.	0 a 1
1	Light air	Rising smoke drifts, wind vane is inactive.	1 a 5
2	Light breeze	Leaves rustle, can feel wind on your face, wind vanes begin to move.	6 a 11
3	Gentle breeze	Leaves and small twigs move, light weight flags extend.	12 a 19
4	Moderate breeze	Small branches move, raises dust, leaves and paper.	20 a 28
5	Fresh breeze	Small trees sway.	29 a 38
6	Strong breeze	Large tree branches move, telephone wires begin to "whistle", umbrellas are difficult to keep under control.	39 a 49
7	Moderate gale	Large trees sway, becoming difficult to walk.	50 a 61
8	Fresh gale	Twigs and small branches are broken from trees, walking is difficult.	62 a 74
9	Strong gale	Slight damage occurs to buildings, shingles are blown off of roofs.	75 a 88
10	Whole gale	Trees are broken or uprooted, building damage is considerable.	89 a 102
11	Storm	Extensive widespread damage.	103 a 117
12	Hurricane	Extreme destruction, devastation.	More than 118

The following formula gives the amount of energy that comes from the wind:

$$P = \frac{1}{2} \cdot \rho \cdot A \cdot V^3$$

Where P is the immediate output power, ρ is the wind density, A is the rotor area and V the wind speed.

If we could get all the energy contained in the wind (which is impossible as Betz has demonstrated), the energy produced during the day would be:

$$E = P \cdot t$$

Where E is the total energy, P is the immediate power and t the time.

Actually, it is not possible to convert all the energy from the wind into electrical energy. There are three main reasons:

- The already mentioned Betz limit, which limits the maximum power obtained to approximately 59%.
- The aerodynamic efficiency of the blades and the mechanical efficiency of the components.
- The electrical efficiency of the generator, controller and inverter.

Therefore, the new formula that we will use to know the generated power is:

$$P = C_p \cdot \frac{1}{2} \cdot \rho \cdot A \cdot V^3$$

Where Cp is the power rate that represents the total systems efficiency. This value is usually between 20% and 30% at rated wind speed.

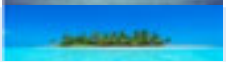
As you can see, the output power varies with the cube of the wind speed. This means that when the wind speed doubles, we can get 8 times as much electricity as we were getting before.

It has been studied that the wind follows the Weibull probability distribution. This distribution has two fine-tuning parameters, C and k:

$$f(x;C,k) = \frac{k}{c} \cdot \left(\frac{x}{c}\right)^{k-1} e^{-(x/C)^k} \qquad para\ x \geq 0$$

Where C is the scale parameter (approximately the average speed of the location) and k is the parameter of the shape. Below is a table showing k values according to the roughness of the land:

When the Weibull's k is unknown, the following values can be used:

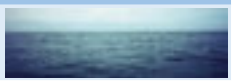
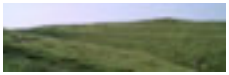
Landscape	Weibull's k	Picture
Land	2	
Sea	3	
Islands	4	

Another important value to know is the roughness of the location, which can determine the wind speed. The rougher the location, the higher you should install the wind turbine. The speed distribution based on the height comes from the following formula:

$$C_p v(z) = v_{ref} \cdot \frac{\mathrm{Ln}(\frac{z}{z_0})}{\mathrm{Ln}(\frac{z_{ref}}{z_0})}$$

Where v is the wind speed with a height z above the ground level and v_{ref} *reference speed, that is, an already known wind speed at a certain height* z_{ref} *. Below you can find a table with some common values of length and roughness.* z_0 *:*

Table of roughness length:

Landscape features	Roughness length	Pictures
Open water	0.0002	
Flat terrain with grass or very low vegetation	0.0024	
Cultivated area, low crops	0.03	
Cultivated area, low crops	0.055	
Some buildings	0.1	
Big trees	0.2	
Villages, small towns, agricultural land with many or tall sheltering hedgerows, forests and very rough and uneven terrain	0.4	

With all these data and with the wind turbine power curve you can get the estimated power produced in a certain period of time.

$$E = 1{,}9 \cdot C_p \cdot \frac{1}{2} \cdot \rho \cdot A \cdot \bar{V}^3 \cdot t$$

Where E is all the energy produced in a certain time t.

Knowing this, and the necessary consumption (you can take the following table as a reference of the daily consumption of a single family house) you will know what kind of wind turbine you need for each application:

Appliances	Power (W)	Quantity	Hours	Daily energy (Wh)
Ilumination	60	10	3	1800
Computer	200	1	2	400
Freezer	200	1	10	2000
Microwave	1000	1	0,5	500
Washing machine	750	1	1	750
Television	200	1	1	200
Other consumptions	1000	1	3	3000
TOTAL				8750

Other factors to take into account are the temperature and the height over the sea level of the location chosen, due to the influence of these factors in the output power.

Air density variation with the temperature:

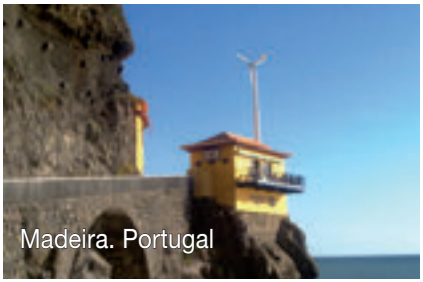
Temperature (oC)	Relative variation of density (with regard to 15 oC)
-20	1,138
-10	1,095
0	1,055
10	1,018
20	0,983
30	0,951
40	0,920

Air density variation with the altitude:

Height (m)	Relative variation of density with regard to the sea level
0	1,000
152	0,990
305	0,970
915	0,910
1524	0,850
2134	0,790
3049	0,700

7 -Common installations

Business:



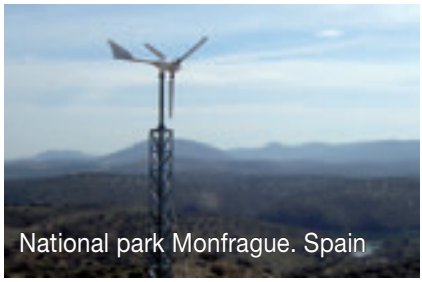
Residential:

Grid connection

Farms and industries:

Water pump:

Isolated installations



Hybrid systems:

8 -Frequently asked questions

1. Which wind turbine power do I need?

The table below shows the type of wind turbine to chose depending on the wind and the power needed. Just as a general reference, the usual consumption at home could be approx. 4000 kWh yearly, while a bigger place could need approx. 6000 or 8000 kWh.

Purpose	Power
Saving energy 1.5 or 3.5 KW	1.5 or 3.5 kW
Self-sufficient normal household	3.5 or 7.5 kW
Self-sufficient high electricity user	7.5 or 15 kW
Energy saving for a small industry or farmer	1.5, 3.5, 7.5 or 15 kW

2. How much space d for a turbine?

Ideally, stand-alone turbines should be located as far away as possible from buildings or trees, which may block the wind and cause turbulence. As a guide, the wind turbine should be about twice the height of obstructions in the immediate front of it (for at least the prevailing wind direction). In general, the turbine should be above the height of nearby obstructions that are within a distance of 10 to 20 meters of the tower heights.

3. Are wind turbines noisy?

WINDSPOT wind turbines have been especially designed to avoid noise with a rated speed between 200 and 250rpm depending on the model. The height at which they are placed makes them almost impossible to be heard by someone staying beside them.

In addition, the slow spinning they have, if we compare it with other small wind turbines increases, the performance and durability of the system reducing the mechanical stress of the components.

4. Will WINDSPOT affect birds?

It is most unlikely that a bird could hit a small wind turbine like the WINDSPOT, since they are placed at a much lower height than the one at which the birds fly when migrating.

5. Can I use WINDSPOT for heating?

WINDSPOT wind turbines can be used for direct heating. However, the energy required

to heat a building is more than the energy used in electricity, so a larger turbine would be needed for building heat.

6. Can I connect WINDSPOT to the grid?

WINDSPOT wind turbines can be connected to the local electricity network. When a wind turbine connection to the main supply is made, it has to be approved by your local electricity distribution utility. This company will require the connection to be of a satisfactory technical standard. The company may also limit the electrical capacity of the wind turbine that may be connected to a particular distribution line.

7. When do WINDSPOT wind turbines produce electricity?

It depends on the wind turbine location, the wind speed and the quality of that wind (the more turbulences the less efficient the system will be).
On a proper place, a wind turbine generates electricity around 75% of the time, although not always at the rated power. Usually, over a year, a small wind turbine can generate about 20% or 30% of the amount it would generate working at constant rated power.

8. How long do WINDSPOT wind turbines last?

WINDSPOT wind turbines are designed to last over 20 years. This is possible because of their robust design, high quality of the materials used anti-corrosion treatments and also due to the fully sealed body which prevents moisture and water to come into the wind turbine.

9. Can I have my own WINDSPOT?

Small wind turbines are a good deal for householders, communities and small energy consumers to use for on-site energy generation. The location, wind speed and local landscape will determine the best wind turbine type and size suiting your needs.

10. How do I find out if my site is windy enough?

The wind speed will be influenced by the local topography and any nearby obstructions such as trees or buildings. Wind movement around buildings is very fickle and sometimes not easy to forecast, so take expert advise if you have any doubt.

Installing a small wind turbine in a site with an average wind speed of 5 m/s is generally worthwhile.

11. How does a wind turbine make electricity?

WINDSPOT wind turbines have three blades facing the wind; the wind turns the blades and this spins the generator shaft. Finally, the controller and the inverter connect to the batteries or the grid.

12. At what height must small wind turbines be installed?

Tower height varies according to wind turbine models and the wind speed at the location. Generally it ranges from 10 to 25 meters. In general, the higher the tower, the higher the average wind speed and the smoother the wind.

The rotor diameter of small wind turbines ranges from 1.5 to 10 m depending on the type of the model. Usually, the bigger the wind generator, the higher it must be installed.

13. Do I need planning permission?

Small wind energy installations may require planning permission and you should always consult the planning officials. It depends mainly on the height and the legislation of each country. The best option is to ask for professional advice if you have any doubt.

14. What are wind turbines made of?

The components of our wind turbines bearing structural stress are made of stainless steel and aluminum and the blades and other components of copper, plastic, polyester resin and glass fiber.
All of them are properly protected against corrosion with hot dip galvanized or other surface treatments. This way WINDSPOT wind turbines are fully protected even in saline environments.

Besides, all the system is sealed in order to avoid the entrance of water, dust or any other particle. This way all the electrical components are perfectly protected.

9 -Commissioning

In order to be eligible for Sonkyo Energy's warranty the Customer MUST return the Site Commissioning Form included in the Warranty Agreement within 30 days of the date of commissioning.

Be informed that Sonkyo Energy obeys the law in force on protection of personal data (Law 15/1999 of 13 December Protection of Personal Data), the user privacy, confidentiality and security of personal data, thereby adopting the technical and organizational measures to prevent the loss, misuse, alteration, unauthorized access and theft of personal data provided, given the state of technology, nature of the data and the risks they are exposed.

Site Commissioning Form is available at www.windspot.es and must be returned duly filled out to info@windspot.es

The serial number can be found on the inside of the right body cover.

10 -CE conformity declaration

DECLARATION OF CONFORMITY WINDSPOT

CE

SONKYOENERGY

SONKYOENERGY S.L.
Pol. de Raos. P12 Nave B3.
39600 Maliaño. CANTABRIA

Hereby declares that the following models:

WINDSPOT wind turbines

1.5 KW	7.5 KW
3.5 KW	15 KW

Meet the essential European Union requirements of design and construction. The products comply with the following European Directives:

-Machinery Directive 2006/42/EC
-Low Voltage Directive 2006/95/EC
-EMC Directive 2004/108/CE

The following harmonized standards were applied:

- UNE-EN 61400-2:2006 : Wind turbines. Design requirements for small wind turbines.
- UNE-EN ISO 61400-1:2006 : Wind turbines. Design requirements.
-UNE-EN ISO 12100-1:2004 : Safety of machinery. Basic concepts, general principles for design. Part 1: Basic terminology, methodology.

Dated, 6th of July 2010

Name: Iñigo González
Manager

11 -ISO 9001 Certification

CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

SONKYO ENERGY, S.L.
Maliaño, Cantabria
Spain

has been approved by Lloyd's Register Quality Assurance to the following Quality Management System Standards:

ISO 9001:2008

The Quality Management System is applicable to:

Design and manufacturing of small wind turbine generators. Commercialization of towers for small wind turbine generators.

Approval
Certificate No: SGI 6010073

Original Approval: 18 October 2010
Current Certificate: 18 October 2010
Certificate Expiry: 17 October 2013

Issued by: LRE, S.A.
On behalf of Lloyd's Register Quality Assurance Limited

UKAS
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This document is subject to the provision on the reverse
71 Fenchurch Street, London EC3M 4BS United Kingdom. Registration number 1879370

NOTES

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